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her eyes; and in the days that followed the anxious lines which had gathered in her face over the care of her many belongings vanished, and erelong she arose from her bed of sickness with the quiet, restful, contented spirit she had lost sight of for years in the struggle to ornament her home.

(To be continued.)

LEAVES FROM THE NOTE-BOOK OF A BELLEVUE NURSE

LECTURE III.—FLUIDS OF THE BODY

(Continued from page 437)

The human body is composed of three different elements, viz.:

(1) Solids—Muscle, Nerve, Bone.

(2) Fluids—Blood, Lymph and Chyle, Transudations, Secretions, Excretions.

(3) Gases—Oxygen, Nitrogen, Carbonic.

Of the solids of the body we will have little to say now. The fluids may, for the sake of convenience, be subdivided into (1) those fluids that remain in the body and have a constant chemical and physical character, except for the changes that occur in them as a result of the process of regeneration and functional action in the body. These fluids consist of (1) blood, (2) lymph, (3) chyle. The two classes of body fluids do not exist preformed in the body, and are of three distinct kinds in character, viz.:

(1) Secretions—Gastric, Saliva, Bile.
(2) Excretions—Urine, Perspiration, Bile.
(3) Transudations—Peritoneal, Pleural.

SECRETIONS.

A secretion is a fluid that is formed in the body, by glands and epithelium, out of entirely different substances that are furnished by the blood, and when they have been used for the purpose for which they were intended, they are reabsorbed by the blood as the elements from which they were made by the glands.

EXCRETIONS.

Excretion is not a part of the blood,—it does not exist preformed in the blood, but is composed of effete matter. The blood acts simply as a vehicle to carry it to the proper organ in the body. The excretions are not reabsorbed into the blood in health, but in disease they are, and cause symptoms of disease.

BLOOD AND BLOOD-VESSELS.

We will consider now the fluids of the body in the form in which we have arranged them. The blood is the most abundant and highly organized fluid in the body. On account of its function of carrying nutrition to the tissues of the body, and taking up the effete matter and carrying it to the proper organ for secretion, it must itself constantly undergo changes of cleansing and regeneration.

The blood gets to the tissues and organs of the body by being forced through the blood-vessels by the heart. There are some tissues of the body which contain no blood-vessels, as the epidermis (cellular layer of skin), nails, hair, etc. They get their nutrition from neighboring parts.

The mechanism of the circulation of the blood in the body was first discovered by Harvey in 1616, but there were certain anatomical facts known about it before this time, as, for example, it was known that there were blood-vessels, heart, etc., but the mechanism was not understood. Aristotle (325 B.C.) knew that there was a heart and blood-vessels, but he thought that the air breathed in by the lungs went to the heart and blood-vessels.

The heart is a hollow, cone-shaped organ, weighing from eight to twelve ounces, lying in the thoracic cavity, or chest. Its base is stationary, being attached to the spinal column by folds of the pericardium, and lies in the median line of the body, about on a level with the fifth or sixth dorsal vertebra. The apex extends downward, outward, and forward to the left side, and strikes the outward part of the chest between the fifth and sixth ribs one-half or one-third to the left of the median line. The heart is a hollow organ having four distinct cavities, two on the right and two on the left, known respectively as the right and left auricle and the right and left ventricle. The walls of the cavities are composed of muscular fibre lined by a membrane (endocardium), which is similar to and continuous with the inner layer of the arteries. The heart is covered externally by a serous membrane, the pericardium, containing one drachm of fluid for lubrication. The right heart is a little larger than the left, and the ventricle larger than the auricle. The ventricle when full will hold from four to seven ounces of blood, but probably expels at each beat only about two ounces, and if we consider that a heart beats seventy times in one minute we will see that one hundred and forty ounces, or about eight and one-half pints, of blood go through it in a minute.

When the ventricle contracts we speak of it as systole, and this is synchronous with the pulse, and occurs about seventy times in a minute; it is a little slower in women and children, and faster in men. When the heart is filling with blood we speak of it as diastole, and when filling it is resting one-half of the time.

The auricles contract immediately before the ventricles, and by so doing force the blood into the ventricles, and these in turn throw it to the lungs and general system. The course that the blood takes in the heart is as follows: The venous blood, loaded with effete matter from the tissues of the body, is emptied by the smaller veins into the larger veins, vena cava ascending (from below) and vena cava descending (from above), and these two veins empty into the right auricle; this contracts and forces the blood into the right ventricle, and this in turn contracts and forces it into the lungs through the pulmonary arteries. This pulmonary circulation, known as the lesser circulation in contradistinction to the systemic or greater, receives the blood from the ventricles, there partially regenerates it, making it a bright red color, arterial, and then it goes by way of the pulmonary veins to the left auricle and thence to the left ventricle, and thence into the system. It can be seen, then, that the heart contains two different kinds of blood, arterial and venous. The two ventricles contract at the same time.

BLOOD-VESSELS.

Blood-vessels are channels (circular) through which the blood gets to and from the tissues. There are three kinds, viz., arteries, capillaries, and veins. There are also three kinds of arteries, large, medium, and small. They differ only in the composition of the coats. The inner coat of the veins and heart is the same, and is principally made up of endothelial cells. There are two other coats.

In the larger arteries, as the aorta, subclavian, iliac, etc., the middle coat is composed of yellow elastic tissue and external fibrous tissue, with a very few muscular fibres. The middle coat of the middle and small arteries is mostly muscular, the external coat is fibrous. It is this muscular coat that controls and equalizes the flow of blood from the heart. The current of blood in the large and medium arteries is intermittent, in the smaller remittent, and when it strikes capillaries it becomes continuous. The vaso-motor nerves control the muscular coat of the arteries and regulate the tension. When these nerves are stimulated the tension becomes high, and then the pulse is less compressible than usual. The tension may become so great that the pulse becomes "small and wiry," or the tension may be nothing; then the pulse is very soft, and when full we have a "gaseous pulse." A dicrotic pulse is when the fingers seem to feel two distinct beats with each contraction of the heart. This occurs when the tension is below normal and the heart is beating forcibly, as in the first and second week of typhoid fever. By feeling the pulse one is enlightened as to the action of the heart and the condition of the arteries and blood. In feeling a pulse we note (1) frequency, (2) rhythm, (3) volume and strength, (4) tension or resistance. There are many conditions that accelerate the pulse above the normal, sixty-five to seventy-five beats per minute,—mental emotion, exercise, rapid breathing, or anything that stimulates the heart. Many conditions cause a slow heart, such as digitalis poisoning, exposure to cold and wet.

RHYTHM.

The normal rhythm is when one beat follows another in regular succession. The rhythm becomes irregular in cardiac and cerebral disease.

VOLUME AND STRENGTH.

The two conditions are similar and often associated, but are not identical. By volume is meant the size of the pulse. By strength is meant the force by which the blood is driven through the arteries. A pulse is said to be full when the artery feels as if it were thoroughly distended, and usually a strong pulse is a full one. This is a pulse of plethora of health, and occurs in the beginning of fevers and active inflammation. A full pulse is not always strong, as in a "gaseous pulse," which denotes exhaustion; there is plenty of volume in it, but no tension or force to the current. It feels as if a bubble of gas were in the vessels. A small pulse is when the arteries seem to be not entirely full, and is usually associated with weakness and debility. A small pulse is not always weak, as in the wiry pulse due to increase of arterial tension in peritoneal inflammation, etc.

ARTERIAL TENSION.

As before said, the muscular coats of the arteries are controlled by the vaso-motor nerves, which belong to the sympathetic nervous system and have their centre in the medulla. When these nerves are stimulated their arteries contract, and vice versa. By arterial tension or blood-pressure is meant that resistance normally felt in the arteries when pressure is made upon them with the fingers. Blood-pressure is maintained by the contraction of the heart and tension of the arteries and arterioles. Anything that causes the heart to beat stronger or stimulates the vaso-motor nerves increases the tension, and vice versa. The tension is increased in many diseases, as Bright's, pneumonia, heart disease, and inflammation below the diaphragm. In the beginning of peritonitis and appendicitis we have a "wiry pulse." In pneumonia the poison in the blood often increases the tension to such an extent that it may paralyze the heart, as in angina pectoris the tension is greatly increased. We call the pulse a "hard pulse" in this case. This must not, however, be mistaken for the "hard pulse" due to hardening of the arterial walls from an inflaming process occurring in them. This process weakens the walls of the vessels, and then often when tension is increased we have rupture of an artery, usually in the brain, with the symptoms that go with apoplexy. This can often be prevented if the tension is watched and kept down. When there is loss of tension we call it a soft pulse, or a compressible pulse. This occurs in low fever, hemorrhage, and debilitating diseases. There is another condition which has to do almost entirely with the elasticity of the artery, and that is dicrotism, which occurs when the tension is very low. It is that condition in which one seems to feel two distinct pulsations with each beat of the heart, due to vibration of the blood-current, which is in turn caused by elasticity of vessels. An intermittent pulse is when the heart misses a beat, which is due to the heart contracting too weakly to make a pulse. Deficiency is when the heart does not really contract.

When an artery becomes one-fifteenth or one-twelfth of an inch, then it is a small artery, and they are called small until they have but a single coat and only one corpuscle can get along in them at a time, when they become capillaries. Capillaries are ultimate endings of an artery, and consist of a single coat, which is the inner coat of the arteries, and it is there that there is an exchange of nutrition, etc., between the blood and tissue. They inosculate freely with one another, and in them the blood-current becomes very slow and the stream continuous, except in certain forms of heart disease, when there is a pulsation or intermittent flow. The capillaries empty into the veins, which are smaller vessels at their origin and become larger as they approach the heart. The veins are vessels that return the blood from the tissues to the heart, have three coats, but no power of contraction, because they have no muscles except in the larger ones. They are slightly elastic but stronger than the arteries, collapse when cut, and have valves to prevent a backward flow.

(To be continued.)